towards zero waste:
eco-towns waste management worksheet

summary points

Managing the waste of a new community of 15,000-45,000 people presents a significant set of challenges. But eco-towns provide an exciting opportunity to provide mechanisms, facilities and services that make it easier for residents and businesses to reduce and manage their waste in a sustainable way. As exemplar developments, eco-towns should aim to achieve more than current best practice. They should be leaders in the transformation from a waste management economy to one based on resource management, and they should contribute to reducing the impacts of waste on climate change.

All eco-towns should adhere to five principles:

- **View waste as a resource.**
- **Take an integrated approach to waste/resource management.**
- **Seek solutions that provide multiple benefits, including contributing to 'zero carbon' development.**
- **Eco-towns as exemplars, going beyond national average expectations.**
- **Eco-towns as catalysts for change for performance in surrounding areas.**

As demonstration projects intended to pilot zero carbon development and more sustainable ways of living, eco-towns should be leaders on minimising and extracting value from waste. As a minimum an eco-town would be expected to:

- ***Plan for zero waste:* Eco-towns should demonstrate how they will move towards zero waste through preparing a waste and resources plan for the development in liaison or partnership with local authorities.**

cont.

- *Set ambitious targets:* Eco-towns should set waste targets that go substantially beyond achieving the Government's 2007 Waste Strategy targets for 2020. Targets should go beyond 2020 – to 2025 – and should prioritise minimisation and re-use as well as recycling.
- *Co-ordinate waste management:* Eco-towns should make the most of the opportunities presented, such as particular synergies for co-management of municipal, commercial and industrial waste.
- *Set high building design standards:* Eco-towns should achieve the maximum points available on all three waste components of the Code for Sustainable Homes. Responsibly sourced materials with lower environmental impacts over their lifecycle should be used, and eco-towns will be expected to maximise credits by using *Green Guide* A-rated building components and construction materials as standard. Non-residential buildings should seek to achieve maximum points for waste and materials under BREEAM.
- *Move towards zero construction waste:* Maximum credits should be sought under Code for Sustainable Homes or BREEAM for construction waste. Eco-towns should exceed the Government's target of at least a 50 per cent reduction in construction, demolition and excavation waste to landfill (compared with 2008).
- *Provide high-quality waste facilities:* All waste facilities should be of high quality, should be visually attractive, and should not detract from their immediate surroundings.

Eco-towns seeking exemplar status in working towards zero waste should build on the minimum expectations and achieve more ambitious outcomes and make substantial contributions to other environmental aims:

- Encourage householders and businesses towards a cultural change such that the waste hierarchy principles are embedded in all aspects of life and work.
- Set targets that focus on waste minimisation in line with European 'best practice'. For example, the Government's target on minimising household waste is 225 kilogrammes per person per year by 2020. Eco-towns could aim for 150 kilogrammes per person per year.
- Extend and identify appropriate and ambitious targets to cover other waste producers – municipal, commercial and industrial.
- Reduce greenhouse gas emissions from waste and resource recovery – including methane.

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Towards Zero Waste:
Eco-towns Waste Management Worksheet
Advice to Promoters and Planners
November 2008

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1 introduction

Managing the waste of a new community of 15,000-45,000 people presents a significant set of challenges. But eco-towns provide an exciting opportunity to provide mechanisms, facilities and services that make it easier for residents and businesses to reduce and manage their waste in a sustainable way. If an eco-town matched the best performing authorities on household waste minimisation, recycling and composting, it would send less than half the amount of waste for recovery or landfill compared with an averagely performing town of the same size.[1]

But as exemplar developments, eco-towns should aim to achieve more than current best practice. They should be leaders in the transformation from a waste management economy to one based on resource management, and they should contribute to reducing the impacts of waste on climate change. By better realising the value of biodegradable wastes, for example, not only could heat and electricity be generated from the material, but its diversion from landfill would prevent its conversion to climate-affecting methane.

This Worksheet provides guidance to those involved with the creation of eco-towns on what these developments could and should achieve in relation to waste management and material resource efficiency. It provides details of pertinent regulations, case studies and sources of further information. It sets out the principles that should guide eco-town proposals and development, and spells out the expected outcomes of an eco-town. It then looks at each step of the waste management process – from minimising waste produced in the first instance, storage and collection, to maximising value through re-use, recycling and recovery.

Suggestions are directed to those involved mainly at the masterplanning stage, with some further guidance provided on the construction and occupation phases.

As exemplar developments, eco-towns should be leaders in the transformation from a waste management economy to one based on resource management

2 principles

Waste management in eco-towns should be be guided by the following principles:

- **View waste as a resource:** Eco-towns should embrace the concept that today's waste is tomorrow's raw material. The design of buildings and supporting infrastructure should consider their future repair and eventual demolition in the selection of construction mechanisms and materials ('cradle-to-cradle' design). The design of communities and supporting services should encourage and enable communities to follow the waste hierarchy – reduce, re-use, recycle, recover, with landfill as the last resort (see Fig. 1).

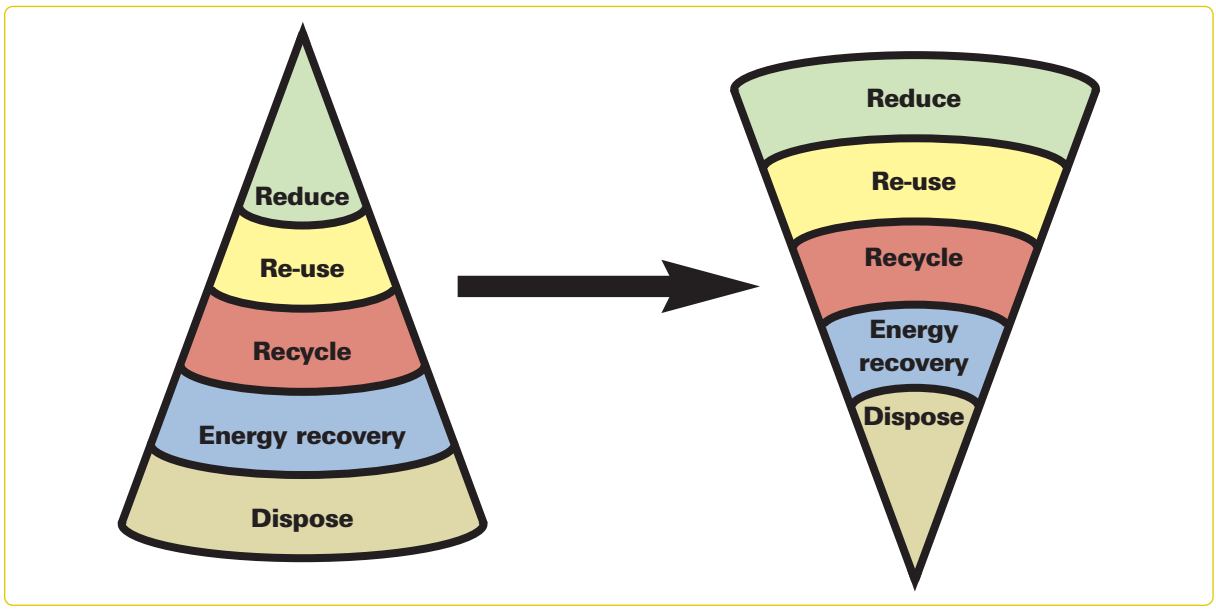

Fig. 1 The waste hierarchy

- **Take an integrated approach to waste/resource management:** Eco-towns should plan for waste by recognising each step in the waste management process as part of a whole – involve all the key players, consider a mixture of waste management options, and consider using a partnership approach.

- **Seek solutions that provide multiple benefits, including contributing to 'zero carbon' development:** Eco-towns should maximise the opportunities, efficiencies and wider benefits of an integrated approach to the provision of waste (and other) services. Eco-towns could, for example:
  - Use inert construction waste as material for sustainable drainage systems (SUDS), landscaping and habitat enhancement schemes.
  - Reduce transport emissions by locating waste facilities close to source.
  - Combine the management of biodegradable waste from different sources, such as joint treatment of sewage with biodegradable waste from households, businesses and farms.
  - Harness energy from waste which cannot be sensibly re-used or recycled, for example through combined heat and power (CHP) and district heating systems.
  - Build community cohesion through partnership working and enabling and encouraging community-based waste and resource initiatives.
  - Create employment in resource sorting, re-use, repair or recovery.

- **Eco-towns as exemplars:** As exemplar places, eco-towns should plan to go substantially beyond the national average expected for 2020 and beyond (see Box 1) in waste prevention, recycling and diversion from landfill, for both business and household waste.

Box 1 Waste Strategy for England 2007

The Government's key objectives

- Decouple waste growth from economic growth and put more emphasis on waste prevention and re-use.
- Meet and exceed the Landfill Directive diversion targets for biodegradable waste.
- Increase diversion of non-municipal waste from landfill and secure better integration of treatment for municipal and non-municipal waste.
- Secure the investment in infrastructure needed to divert waste from landfill.
- Get the most environmental benefit from that investment, through increased recycling of resources and recovery of energy from residual waste.

The aim is to produce an **overall net reduction in global greenhouse gas emissions from waste management** of 9.3 million tonnes (equivalent) per year compared with 2006.

Waste Strategy 2007 targets

1 **Reduce the amount of household waste not re-used, recycled or composted**, from 22.2 million tonnes in 2000 to:
   - 15.8 million tonnes in 2010 (29 per cent).
   - 12.2 million tonnes in 2020 (45 per cent), equivalent to a reduction from 450 kilogrammes per person (in 2000) to 225 kilogrammes (in 2020).

2 **Recycling and composting of household waste:**
   - 40 per cent in 2010.
   - 45 per cent in 2015.
   - 50 per cent in 2020.

3 **Recovery of municipal waste:**
   - 53 per cent in 2010.
   - 67 per cent in 2015.
   - 75 per cent in 2020.

4 **Landfilling of construction, demolition and excavation wastes to fall by 50 per cent by 2012.**

Priority material streams

The Waste Strategy 2007 also identified a number of priority waste streams:

- **Paper and card:** Increased recycling; increased procurement of recycled paper.
- **Food and garden wastes:** Use of anaerobic digestion (food wastes); increased composting (garden and some food); reduced food industry waste.
- **Aluminium:** Higher packaging waste recycling targets.
- **Glass:** More closed-loop recycling; more light-weighting; collection services from small businesses; minimum recycled content for glass products.
- **Plastics:** Higher packaging waste recycling targets; increased recycling of plastics; increased recycled content of plastic containers.
- **Wood:** Develop energy markets for waste wood.
- **Textiles:** Higher levels of textile re-use and recycling; more added value for recycled textiles.

Culture change

- Providing more recycling bins in public places (or harvesting recyclables from litterbins).
- Greater emphasis on promoting the reduction of waste and increase recycling in schools (sustainable schools, eco-schools).
- Reduction and recycling of government's own waste:
   - 5 per cent reduction in total waste arisings by 2010, 25 per cent reduction in total waste arisings by 2020 – relative to 2004/05.
   - 40 per cent recycling rates by 2010, 75 per cent recycling rate by 2020.
- These aims should be incorporated into the design of public space, schools etc.

- **Eco-towns as catalysts for change:** Eco-towns should demonstrate better ways of living and catalyse culture change in behaviour. They should support surrounding areas in improving their performance on waste management by providing state-of-the-art infrastructure and trialling new incentive schemes to minimise, re-use and recycle.

3 outcomes

Eco-towns will be national demonstration projects intended to pilot zero carbon[i] and more sustainable approaches to living. They are expected to take advantage of the opportunity for whole-town design and have high environmental standards. The Government has stated that they expect eco-towns to be leaders on minimising and extracting value from waste. This Section explains what this means in terms of expected outcomes.

3.1 Towards zero waste

Zero waste provides a useful framework for thinking about what eco-towns should be seeking to achieve (see Box 2). Aiming for zero waste will mean rethinking waste as a potential resource with value to be realised, rather than as a problem to be dealt with, usually by burial in landfill sites. Most areas that have adopted a zero waste goal define this as zero waste to landfill achieved over a 10-20 year timescale,[2] with effort focused on waste minimisation and re-use. Zero waste is a target to be strived for, not an absolute, and landfill is likely to remain the best option for some types of waste.

Box 2 Zero waste

Zero waste is a unifying concept for a range of measures aimed at eliminating waste and allowing us to challenge old ways of thinking:

- It reconfigures the current waste management culture to a value recovery culture.
- It encourages new ways of thinking and the use of new tools so that normal everyday activities contribute to the answer rather than the problem.
- It shifts from a linear resource use and disposal culture to a 'closed-loop' system mimicking nature's successful strategies.
- It supports communities in achieving a local economy that operates efficiently, sustains good jobs, and provides a measure of self-sufficiency.
- It maximises recycling, minimises waste, reduces consumption and ensures that products are made to be re-used, repaired or recycled back into nature or the marketplace.

Based on SDC Scotland (2008) *A Burning Issue: Energy from Waste in Scotland*. Sustainable Development Commission Scotland: Edinburgh, quoting from the Zero Waste New Zealand Trust

Moving towards zero waste is as much a cultural as a physical challenge. It is reliant on changes in behaviour and in policy and delivery at strategic levels (for example in products policy). The concept is powerful and sets an appropriate aspirational goal for eco-towns and surrounding areas. Achieving it will require a high level of community involvement, promotion and education and the use of initiatives such as variable charging for waste.

i The definition of zero carbon for eco-towns is defined in the Eco-towns PPS – see also the Eco-towns Energy Worksheet

3.1.1 *Zero waste case studies*

In the Japanese village of Kamikatsu, a zero waste policy has led to 98 per cent of the population of 2,000 using home composting, and to recycling rates of 80 per cent – with waste sorted into 34 different recycling categories.[3]

In England, Bath and North East Somerset Council was the first local authority to commit to a zero waste policy, which it wants to achieve by 2020. It set an interim target of 50 per cent recycling by 2010 (ten years ahead of the national target) and an explicit aim of arresting growth in waste despite expected population increases in the area.[4] Defra recently launched a competition to encourage and support more localities to come forward as zero waste places.[ii]

The vision for a zero waste Scotland[5] was announced by the Scottish Government in January 2008. It identified tough targets, including:

- Increasing the amount of municipal waste being recycled or composted to 60 per cent by 2020, and a new target of 70 per cent by 2025.
- Reducing landfill from municipal waste to 5 per cent by 2025, with no more than 25 per cent of municipal waste to be used to generate energy by 2025, and the rejection of large, inefficient incinerators.
- Keeping the existing challenging target of stopping the growth in municipal waste by 2010.

Eco-town proposals will be expected to demonstrate how they will move towards zero waste

3.2 Expectations for all eco-towns

All eco-towns must meet the minimum standards outlined in the eco-towns PPS. As eco-towns are to be leaders on minimising and extracting value from waste, eco-town proposals will be expected to demonstrate how they will move towards zero waste. This will involve preparing a waste and resources plan for the development that will:

- Define the objectives that should guide decisions, including the goal of zero waste for the eco-town and wider area.
- Set out a route map that shows how the objectives will be achieved throughout the design, construction and occupancy phases, including timeframes for appropriate supporting or interim targets.
- Outline how progress will be monitored and reported for the eco-town.

ii Existing localities have been invited to bid to become zero waste places (the closing date for bids was 17 Sept. 2008), and six schemes have now been chosen by Defra

These plans should be produced in liaison or partnership with relevant local authorities (see Section 4 of this Worksheet).

3.2.1 Waste targets

All eco-towns, once occupied, should go substantially beyond achieving the 2007 Waste Strategy[6] targets for 2020 (see Box 1), a key objective of which is to decouple waste growth from economic growth and put more emphasis on waste prevention. Eco-towns should aim to identify targets beyond 2020 – to 2025, and perhaps as far as 2040, as waste processing contracts can be fixed for 25 years. Scotland, for example, has a municipal recycling target of 60 per cent for 2020 and 70 per cent for 2025. This would be an appropriate level of ambition for eco-towns as far as recycling is concerned. However, eco-town proposals should identify standards that prioritise minimisation and re-use as well as recycling. The standards should be in line with Local Area Agreement (LAA) waste indicators to better enable monitoring (see Box 3).

Box 3 Local Area Agreement household waste indicators

NI 191: Residual household waste per household
Measures the amount of residual household waste that is not re-used, recycled or composted.

NI 192: Household waste recycled and composted
Measures the percentage of household waste sent by the local authority for re-use, recycling or composting or treatment by anaerobic digestion.

NI 193: Percentage of municipal waste landfilled

3.2.2 Co-ordinated waste management

Opportunities presented by eco-towns such as particular synergies for co-management of municipal, commercial and industrial waste should be considered as part of the development. Businesses locating in an eco-town should be expected to be good performers on waste and resource management and to actively contribute to the environmental performance of the eco-town.

3.2.3 New homes and buildings

All new homes will achieve the mandatory elements of the Code for Sustainable Homes[7] (CSH) on waste. Eco-towns should aim to achieve the maximum points available on each of the three waste components: storage of non-recyclable waste and recyclable household waste, construction waste management (see below), and composting. Achieving maximum credits will make it easier to achieve higher levels of the Code. Eco-towns should seek to use responsibly sourced materials with lower environmental impacts over their lifecycle. All new homes will achieve the mandatory elements of the CSH on materials, based on the *Green Guide to Specification*.[8] Eco-towns will be expected to maximise credits by using *Green Guide* A-rated building components and construction materials as standard.

Non-residential buildings should seek to achieve maximum points for waste and materials under BREEAM. This will contribute to achieving a high BREEAM level, such as 'Very good' or 'Excellent'.

3.2.4 Construction waste

As for all construction projects in England worth more than £300,000, eco-towns will be expected to have a detailed Site Waste Management Plan. Maximum credits

should be sought under CSH or BREEAM, with those of the latter being more demanding than the former (see Annex 3 of this Worksheet). Eco-towns should not only achieve the Government's target of at least a 50 per cent reduction in construction, demolition and excavation waste to landfill (compared with 2008), but will be expected to achieve a level of construction waste management that surpasses the 70 per cent target agreed in the revisions of the Waste Framework Directive.[9] Lessons from eco-towns should inform the development of post-2012 targets for construction waste.

3.2.5 Waste facilities

All waste facilities should be of high quality, should be visually attractive, and should not detract from their immediate surroundings. Waste management facilities must meet all regulatory requirements and standards and should aim to demonstrate at least some elements of good or best practice, as outlined in the Defra guide, *Designing Waste Facilities*.[10]

3.3 Going further: exemplar status

Eco-towns seeking exemplar status in working towards zero waste should achieve more ambitious outcomes and make substantial contributions to other environmental aims, such as reducing greenhouse gas emissions. As well as meeting minimum expectations, the eco-town should aim to:

- **Encourage householders and businesses towards a cultural change such that the principles of the waste hierarchy and using resources more efficiently are embedded in all aspects of life and work.** Effective behavioural change, waste minimisation, resource exchange and recycling awareness campaigns should be put in place to minimise both municipal and commercial/industrial waste.

- **Set targets for waste that focus on waste minimisation, and are in line with European 'best practice'.** These could include a target for a reduction in total waste arisings on a per-capita basis for households. The Czech and Slovak Republics produced 300 kilogrammes per person per year in 2006; in the UK the figure was 588 kilogrammes. Zero waste exemplar eco-towns will need to go further than the Government's target on minimising household waste that is not re-used, recycled or composted. The Government's target is 225 kilogrammes per person per year by 2020. Eco-towns could aim for 150 kilogrammes per person per year. Residual waste arisings of 159 kilogrammes per person per year (from a total per-capita generation of 560 kilogrammes) has been achieved in Flanders, Belgium.[11]

- **Recover maximum value from residual waste and aim for zero waste to landfill for all waste streams that can and should be diverted to alternative treatment and disposal.**

- **Extend and identify appropriate and ambitious targets to cover other waste producers – municipal, commercial and industrial.**

- **Reduce greenhouse gas emissions from waste and resource recovery.** LAA indicators for reductions in carbon emissions only consider carbon dioxide, focusing on emissions from buildings and transport. Methane is a potent greenhouse gas, produced by decomposing biomass. An eco-town should plan to minimise all greenhouse gas emissions from across the waste cycle.

- **Achieve the equivalent of exemplary level requirements to accomplish an innovation credit for construction waste management under BREEAM (see Annex 3 of this Worksheet).**

4 planning for waste

This Section outlines the basic strategic thinking needed with regard to waste management planning in an eco-town. In all matters, early liaison with the relevant authorities and stakeholders is essential, particularly if there are plans for the potential adoption of new approaches and facilities, in order to identify opportunities as well as any potential barriers.

4.1 Waste strategy and the waste spatial planning framework for eco-towns

The eco-town will sit within a waste strategy and waste planning framework that is the responsibility of local authorities. Local authorities have three main waste responsibilities: waste collection, waste disposal, and waste planning. For unitary authorities, these responsibilities are vested in a single authority. In two-tier areas, the district, borough or city council is normally the waste collection authority, and the county council is the waste disposal and waste planning authority.

Waste collection and disposal authorities work together to produce joint Municipal Waste Management Strategies (MWMSs). The MWMS should provide a clear framework for the management of municipal waste and waste from other sectors as appropriate. It should set out how authorities intend to optimise current service provision, provide a basis for any new systems or infrastructure that may be needed, and identify how the authorities intend to meet their obligations under the Landfill Allowance Trading Scheme. The MWMS is intended to act as an up-to-date, regularly reviewed route map for further investment required to achieve its targets. The MWMS sets the framework within which the authorities will let their waste collection and disposal contracts. It will also inform and be informed by any waste-related spatial plan. Guidance on MWMSs is available from Defra.[12] Some local authorities have developed zero waste strategies (for example Doncaster Metropolitan Borough Council[13]) which may provide some ideas for eco-towns.

The Spittelau energy from waste and CHP facility in Vienna

The planning framework for waste is provided within the Regional Spatial Strategy (RSS) and Local Development Framework (LDF). The RSS guides the LDFs on key strategic issues, such as the amounts of waste requiring management and any pattern of regionally significant waste management facilities that are required. The LDF should take this strategic framework and provide a strategy, supporting policy and sites (or suitable areas) that enable planning applications to be determined in accordance with the spatial plan.

Effective community engagement in decision-making is a central principle in both the preparation of MWMS and the waste spatial planning system. Policy on preparing waste spatial plans and determining waste planning applications is given in Planning Policy Statement (PPS) 10: *Planning for Sustainable Waste Management*. Other Planning Policy Statements – covering procedural matters and waste-related matters – are also relevant, including the eco-towns PPS. Some local authorities provide Supplementary Planning Guidance on waste for new developments that should be referred to if relevant to the location of the eco-town, or which should be used as a guide.

MWMSs and the waste spatial planning framework operate at a higher spatial level than the eco-town. It is crucial that the needs of the eco-town are integrated into the strategy and plan preparation and review processes by the waste authorities. This may mean revising waste development documents.

4.2 Permitting

The Environment Agency is the organisation responsible for regulating most waste management activities in England, including facilities for the collection, treatment, recovery and disposal of wastes in order to prevent pollution of the environment or harm to human health. Most waste management facilities will require an environmental permit to operate, except where they are exempt from environmental permitting, in which case they will require an exemption. The Environment Agency's guide for developers[14] outlines the key obligations and responsibilities of developers, and gives a checklist of the main Environment Agency consents and permissions. Waste issues, construction and land contamination are among the matters covered. Further information on permits and regulations can be found on the NetRegs portal, at **http://www.netregs.gov.uk/**, and on the Defra and Environment Agency websites – **http://www.defra.gov.uk/environment/epp/index.htm** and **http://www.environment-agency.gov.uk/epr**, respectively.

4.3 Integrated decision-making

The 2007 Waste Strategy (Annex B) outlines how effective waste management decisions are best taken by using an integrated approach. It stresses the importance of partnership working; choosing the right solutions and technology for the location; not being over-reliant on a single waste management option; applying the proximity principle; and utilising lifecycle analysis. It also highlights decision-making tools – such as the Environment Agency's lifecycle analysis tool designed for municipal waste managers, WRATE (Waste and Resources Assessment Tool for the Environment), and the Construction Resources & Waste Platform's (CRWP's) Roadmap,[15] which developed a three-step decision-making approach to product selection. Such tools may aid decision-making for eco-towns.

Eco-towns provide an excellent opportunity for industrial symbiosis – encouraging traditionally separate industrial sectors to work together in a mutually beneficial way to minimise waste and make efficient use of materials, energy, water, expertise, capacity and logistics. Organisations such as the National Industrial Symbiosis Programme (NISP)

and Envirowise could help to identify opportunities for greater resource efficiency and waste management between businesses and organisations in and around eco-towns (see Box 4).

Box 4 NISP case study – meat and bone meal fuels cement production

John Pointon & Sons Ltd, based in Staffordshire, is the largest single-site animal renderer in the UK. The company converts a range of animal by-products into useful products, eliminating potential sources of pollution, contamination and disease.

Through NISP, John Pointon & Sons Ltd began a trial with Castle Cement to see if one of these derived products, meat and bone meal (MBM), could be used as an alternative fuel source for Castle Cement's kiln operations. The trial found that MBM, a product previously sent to landfill, is ideal as a fuel source owing to its high calorific value. In addition, the combustion of MBM generated significant quantities of calcium salts which could be used as a raw material replacement.

As a result of the scheme:

- 100,000 tonnes of waste were diverted from landfill in two years, and carbon dioxide emissions were reduced by over 100,000 tonnes.
- Ten jobs were created.
- Disposal and raw fuel costs were reduced – benefiting both the companies and the environment.

5 detailed outcomes

An integrated approach to waste management requires thinking through each step in the waste management and resource recovery process in the occupation phase. This Section outlines the key steps of the waste management process – from minimising waste produced in the first instance, storage and collection, to maximising value through re-use, recycling and recovery – covering major issues, options and further guidance. Issues pertaining to processing and treatment of waste streams are outside the scope of this document, although options for biowastes are identified. The construction phase of development is dealt with separately.

5.1 Reducing the use of resources in the first place

Reducing the amount of resources used and the waste produced will make the greatest impact in terms of saving resources (including carbon) and reducing costs. Achieving waste reductions will require a range of measures that will be largely the responsibility of the local authority, or potentially the eco-town management body (see also the Sections of this Worksheet on re-use and biowastes).

Measures that could help reduce resource use that eco-towns should consider include:

- **Providing more information to consumers about the amount of waste they produce.** Consider trialling schemes and technologies that measure (in real time) waste produced and feed that information back to consumers.

- **Encouraging and rewarding sustainable waste behaviour by using revenue-neutral incentive schemes such as charging for waste collections by weight/waste-type/frequency, so that those who prevent waste and recycle the most pay the least (see, for example, Box 5).** Defra recently launched draft

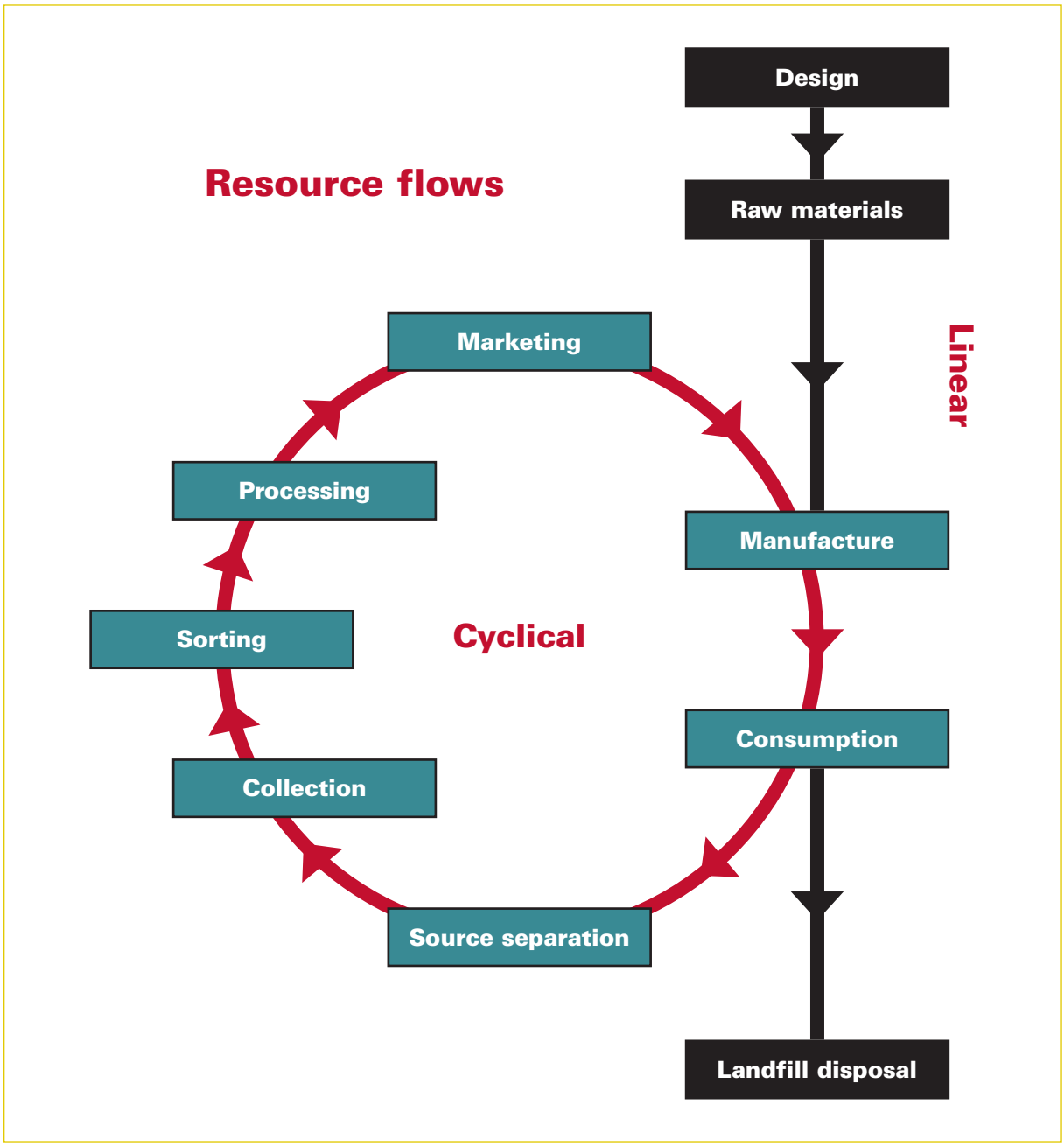

Fig. 2 Comparing linear and cyclical waste pathways
Source: Zero Waste New Zealand Trust

guidance for up to five pilots on waste incentive schemes. Schemes could be rebate-only, offering rewards to those producing the least waste, or they could be charge-and-rebate based, levying charges on those producing the most waste and using these to reward households which generate the least. Schemes must be revenue-neutral, so any money raised through charges should be paid back as rewards. Local authorities would not be able to keep any of the revenue.[16]

Box 5 Oxfordshire Waste Partnership incentive scheme for waste minimisation

Oxfordshire Waste Partnership has introduced waste prevention targets for its member councils. It has created a payment system which applies the variable charging concept to authorities rather than individual households. Councils will be paid £20 for every tonne of waste they are under target and fined £20 for every tonne they are over target.

- **Where appropriate, furnishing homes with products designed to reduce waste.**[17]

- **Gaining agreements with local businesses and public sector organisations in the area (including educational and health facilities) on targets for waste prevention (and recycling) – for example through procurement.**

- **Developing data and information monitoring systems that provide feedback on progress in reducing total waste arisings from all sources.**

Developers should:
- Liaise early with the relevant waste planning authority to discuss the potential for trialling innovative waste data and reporting systems that could be linked to variable charging schemes.

Local authorities should:
- Consider trialling financial incentive schemes in eco-towns, and liaise with developers on appropriate design and technology issues.
- Encourage social housing providers in particular to furnish homes in a way that helps to reduce waste.
- Investigate the potential for agreements with businesses and public bodies on waste prevention and recycling targets.

Businesses and other public bodies should:
- Look at their processes to minimise the unnecessary waste of raw materials and energy and consider opportunities for industrial symbiosis.

5.2 Storage, collection and transport

One of the keys to maximising value from what waste is produced is to sort waste streams at source (in the home or at business premises) and follow this through with appropriate collection systems.[iii] Best practice waste collection arrangements are based on collection frequency and bin size, as well as the separation of key recyclables, including separate collection of food waste.

The collection of household waste is the responsibility of the waste collection authority (WCA). The WCA must also collect, if requested, commercial wastes, although it may charge for this service. The WCA may also collect industrial wastes if requested, but it does not have to and can charge for the service. The decisions made by the WCA and other stakeholders on collection systems will be crucial to:
- Which materials they can recycle.
- The quality of the material they can send for reprocessing.
- The revenue they obtain from such material.
- Whether they can use composting and/or anaerobic digestion processes.
- The relevance of mechanical and biological treatment plant and thermal treatment technologies in dealing with residual waste.

Eco-towns provide an ideal opportunity to demonstrate how waste management facilities can be successfully integrated into the townscape. The space and organisation needed for waste requires careful thought at the scale of both the home and the street. Guidance relating to the streetscape can be found in the *Manual for Streets*.[18] Innovative technologies, such as piped underground refuse collection

iii Although source separation can result in less material going for recycling than co-mingling schemes, the reduction in contamination can result in a higher proportion of goods being recycled, increased revenue from the sale of materials, and a lower carbon footprint

systems, can have a significant effect on the design of a development, removing the need to store refuse in bins and for dustcarts to enter the area to collect most of the waste. They are economical to install at densities above 30 dwellings per hectare and have been used in several European countries[19] (see Box 6).

Developers should:

- Liaise early with the local authority on collection choices and how these may impact upon the options for other waste infrastructure.
- Ensure adequate interior and exterior storage space and give thought to spatial issues for waste collection, especially (but not just) in multi-occupancy areas. Consider how to minimise any effect or risk of smells, insects, vermin and scavenging, by, for example, making sure that storage spaces are shaded from the sun and take advantage of natural air circulation/ventilation.
- Carefully consider novel 'in house' systems for segregation (and collection) of materials. Ensure that residents do not 'pay twice' for innovative waste services (through a waste management service charge and unreduced council taxes).
- Ensure that there is suitable provision for recycling in public spaces. Follow the Voluntary Code of Practice and Good Practice Guidance produced by Defra under the title *Recycle Bins in Public Places: 'Recycle on the Go'*.[20]
- Aim to reduce transport-related emissions by using/locating waste infrastructure facilities close to source/on-site and with regard to end-use.
- Plan for locally sited re-use/civic amenity sites located on 'regular routes', so that people do not have to make 'dedicated' journeys to them.

Local authorities should:

- Better co-ordinate collection of household and other waste streams. The collection of household waste should be linked with that from shops, restaurants, pubs, schools, healthcare facilities, businesses etc.
- Enable and encourage recycling from households so that all seven priority materials are separately collected from any waste not intended for recycling.
- Provide communal recycling facilities for groups of small shops and businesses.
- Promote good waste management practices to both householders and industry through awareness and behavioural change campaigns.
- Apply to have their civic amenity site approved as a designated collection facility for WEEE items (i.e. those covered by the Waste Electrical and Electronic Equipment Directive), and consider having a collection service (free or chargeable).
- Consider linking collections in the rest of the local authority area to those of eco-towns, eliminating a 'two-tier system' and improving performance across the local authority.
- Consider the evidence and guidance produced by WRAP (Waste and Resources Action Programme) from trials (concluded in 2008) on food waste collection arrangements in local areas.
- Separate clean wastes at source to increase the likelihood of closing the recycling and new product manufacture loop.

Businesses and other public bodies should:

- Encourage employees to separate at source in the workplace.

5.3 Gaining value

Much that is thrown away has value that can be recovered. Following the waste hierarchy, some can be re-used, other waste can be recycled, while energy may be recoverable from a significant portion of the remainder. The greatest value – in terms of environmental, economic and social benefits – is generally achieved at the higher end of the hierarchy.

5.3.1 Re-use

Re-use means using an object or material again, either for its original purpose or for a similar purpose, without significantly altering the physical form of the object or

material. The voluntary and community waste sector has lead the way in this sector, pioneering services such as the re-use of furniture and white goods (see Box 7).

Working together, developers, local authorities and the voluntary and community sectors should:

- Provide a covered re-use area at the local civic amenity site for people to swap items, and consider setting up other sites through schools, shops and community centres.
- Encourage setting up a local Freecycle group, and inform residents of its existence.
- Establish a material exchange for use within the eco-town and its surrounding area. Materials exchanges, such as the Materials Exchange for the East of England (Eastex), are orientated towards the commercial, voluntary and public sectors, and may be advertised free or with a charge.

Box 6 Case study: Hammarby Sjöstad, Sweden

Vacuum-operated inlets to the underground waste collection system at Hammarby Sjöstad

Three waste management levels operate in Hammarby: building based, for separating waste at source and operated through vacuum-operated and centrally connected chutes to an underground waste collection system; block-based recycling rooms; and area-based hazardous waste collection points.

Sludge that is separated from waste water is used to produce biogas. Most of the biogas is currently used as fuel in eco-friendly cars and buses, and also in approximately 1,000 gas stoves. It is estimated that the waste water from a single household produces sufficient biogas for the household's gas cooker.

All storm water, rainwater and snowmelt is treated locally. Solutions include the use of a set of three canals that run through the district and channel water to treatment locations, designed to also provide a pleasant visual effect. The 'water ladder' received a prize from the Swedish Association of Architects in 2005.

5.3.2 Recycle

The main challenges with regard to recycling are encouraging recycling behaviour and finding stable markets for recyclates. It is this final aspect – finding a market for

recyclates – which is often the limiting factor for recycling rates, particularly for certain materials such as hard plastics; although funding mechanisms can also create significant barriers and disincentives.[21]

Local authorities, in partnership with business, voluntary and community groups should:

- Encourage and enable markets for recycled products, through developing procurement guidelines for public bodies, businesses and other organisations. For example, the Kent Green Buyers Club brings together businesses that can supply recycled-content products with those who are responsible for buying or specifying – see **http://www.remade-southeast.co.uk/remade_06/projects/kgb.asp**.

Box 7 Case study: Warwickshire County Council's Goods Again scheme

Unwanted electrical items come from the Warwickshire County Council's waste recycling centres or are collected, free of charge, by charities involved in the Goods Again project. Some Coventry schools encourage pupils learning about waste to bring in small, unwanted electrical items for collection by Goods Again.

Under the tuition and supervision of qualified instructors, prisoners at Onley Prison test, refurbish and/or repair electrical items suitable for re-use. Those beyond repair are stripped down for re-usable parts. A key element of the Goods Again project is the opportunity it offers to prisoners. The workshop takes 24 at any one time. They learn new skills and work towards a City & Guilds qualification at the end of their training course.

Once processed, re-usable electrical goods are transported to charitable organisations for redistribution to needy people who can't afford new items.

Goods Again charges a nominal amount per item, averaging around £35 for white goods such as cookers, fridges and freezers. The charities then decide what charge to pass on to the end-user.

5.3.3 Bio(degradable) wastes

Biowaste is often taken to mean the biodegradable organic fraction of the municipal waste stream, including garden waste, food waste and other biodegradable material such as paper. The definition can also be extended to include similar biodegradable wastes from commercial and industrial sources, together with sewage sludge and agricultural manures and slurries. However, it does not include clinical bio-hazardous wastes.

Biowastes contain carbon. In landfills, much of this carbon is converted to carbon dioxide and methane, a very potent greenhouse gas. Successful biowaste recovery obtains value from the carbon while minimising its release to the atmosphere in the form of greenhouse gases. Value can be recovered by producing energy, by using it as a source of organic carbon in soils, or by a combination of the two.

It is often a good environmental option to recover energy from biowastes as part of their treatment. The 2007 Waste Strategy favours source segregation of food waste for anaerobic digestion over alternative methods such as in-vessel composting (IVC), as IVC does not produce renewable energy and is more expensive. Currently only 2 per cent of the available food waste is collected separately.[22] Wood waste cannot be treated by anaerobic digestion and 'is energy intensive to recycle or re-use', with burning the most efficient end-use.[23]

Producing energy

The Eco-towns Energy Worksheet should be referred to in considering how waste streams could contribute to a zero carbon strategy for an eco-town. Eco-towns are encouraged to consider the use of combined heat and power (CHP) to provide electricity for local development or the national grid and direct heat for local development. The immediate and long-term supply chain and sourcing of fuel is a key factor in decision-making. Biowastes could present particular opportunities here. A biomass CHP plant could be powered by using local wood fuel (including waste wood), food waste drawn from the locality, and/or biodegradable waste from agriculture and sewage activities to produce biogas via anaerobic digestion. For example, Biffa and Severn Trent Water jointly operate an anaerobic digestion plant at the Wanlip Sewage Treatment Works linked to the recycling facility at Bursom – see **http://www.biffaleicester.co.uk/about/composting.php**.

Use of digestate/composting

Composting can play an important role in diverting biowastes from landfill and in recovering value from them, provided that the process is carried out properly. Composting facilities that have poor-quality feed stock, that are not operated correctly or that use unsuitable raw material have the potential to cause environmental pollution – including detriment to local amenities and harm to human health – and to produce poor-quality compost.

The aim of composting should be to produce quality compost. Those involved with waste composting should adopt the Compost Quality Protocol.[24] The resulting compost (or digestate from anaerobic digestion) could be used to improve the organic matter content of soils, perhaps to support local parks and gardens and local businesses, especially in horticulture or agriculture. It could also help to reduce the potential for run-off as part of a sustainable drainage strategy.

Key points to note are the importance of source segregation and collection, the location of composting sites, their design, and the quality of output. Waste planners and developers must consider the availability of local land and relevant regulatory controls for any soil conditioner outputs when making investment decisions on

East London Community Recycling Partnership's local recycling initiative on the Nightingale Estate in Hackney serves 1,000 high-density homes collecting dry recyclables and biodegradable waste

biological waste treatment plants. The Environment Agency has issued advice and guidance on composting and other methods to manage biowastes.[25]

Developers should:
- Liaise with the relevant local authorities and organisations such as NISP to identify opportunities for bio (and other) wastes in and around the eco-town, particularly in relation to contributing to zero carbon development.
- Install home composting systems for garden and/or food waste and provide community composting areas.

Local authority, voluntary and community partnerships should:
- Seek opportunities for maximising the value of biowastes derived from the eco-town community and the wider local authority area.
- Provide supportive advice and training to residents as well as positive feedback on where soil improvers have benefited the community.

5.3.4 Disposal

Waste disposal is the bottom of the waste hierarchy and should be a last resort for the management of an eco-town's waste. However, it is important to acknowledge that some disposal of waste, particularly to landfill, will be necessary now and in the future. Landfill is the only viable option available for some waste streams – those that cannot usefully go to alternative treatment, those that pose no threat to the environment, or those where further value cannot be recovered.

6 construction and materials

The Strategy for Sustainable Construction,[26] launched in June 2008, provides clarity around the existing policy framework and signals the future direction of Government policy. It includes sections on waste and materials, setting out overarching national targets together with actions and deliverables.

6.1 Construction waste

Traditionally, the resource-intensive nature of construction, along with timeframe and design constraints, has resulted in significant resource wastage. Studies show that between 10 per cent and 30 per cent of materials delivered to site go straight to waste,[27] and over a third of fly-tipped rubbish includes construction waste.[28] Over recent years, the industry and regulators have done much to combat this, with an increasing focus on better waste management.

The Site Waste Management Plan (SWMP) framework builds on this progress by requiring constructors to plan for waste management in advance. It is based upon the principle that improved monitoring of actual materials usage and waste arisings will lead to greater awareness, encouraging benchmarking and setting targets for the reduction of waste. Additionally, the framework aims to reduce waste crime by ensuring that construction companies are aware of how and when wastes are taken off-site, assisting them in fulfilling their Duty of Care and reducing potential for fly-tipping. The regulations will apply to all eco-towns.

A number of tools have been developed to assist constructors, such as the SMARTWaste Plan (see **http://www.smartwaste.co.uk/**), a free web-based tool for preparing, implementing and reviewing a SWMP which includes an integrated waste measurement tool aligned to defined waste groups and BREEAM/CSH requirements

(see Annex 3 of this Worksheet). BREMAP is a geographical information system of waste management facilities – see http://www.smartwaste.co.uk/.

For eco-towns, the Strategy for Sustainable Construction targets are expected as minimum standards, to be achieved from the start of the development process. The targets are not as stretching as those identified in the draft strategy, which included reducing construction, demolition and excavation waste to landfill to zero by 2020. A number of building contractors, property developers and construction firms (for example Skanska, Lend Lease and Wates Construction) have committed to more ambitious targets than are proposed in the published strategy, with most aiming to send zero non-hazardous waste to landfill by 2010 or 2012. Eco-towns should aim for this level of exemplary but achievable targets for construction, demolition and excavation waste.

6.2 Sustainable and responsibly sourced materials

In construction terms, materials and product choice is undertaken within the design phases and can be influenced by the clients' brief and choice of professional advisers. The Construction Resources and Waste Roadmap outlines a three-step approach to

Box 8 Three-step approach to product selection

In the absence of full and comprehensive life cycle assessments (LCAs) for all construction products, the Construction Resources and Waste Roadmap project developed the following three-step decision-making approach to product selection. First, ensure that operational water and energy efficiency have already been designed in. Then follow these three steps:

Step 1 – Choose A-rated specifications
There is a well-defined route to specifying construction elements that have lower environmental impacts. The *Green Guide to Specification* (http://www.thegreenguide.org.uk) contains typical wall, roof, floor and other constructions listed against a simple environmental rating scale running from A+ (good) to E (poor). Twelve different environmental impacts are individually scored. Ratings enable users to select materials and components based on their overall environmental performance over the building's life.

Step 2 – Choose products within A-rated specifications that offer enhanced environmental performance
The *Green Guide to Specification* ratings are based on standard products used within the specifications listed. It should be possible to identify products that perform better than average – for example, by comparing 'Ecopoints' per square metre. If such LCA data are not available, the decision-maker needs to establish a consistent way of selecting products based on other data (for example, those in step 3).

Step 3 – Improved material resource efficiency of selected products
Extracting the LCA data for material resource issues will help to identify products that also offer lower impact in terms of:

- Lower wastage rates.
- Lower/zero hazardous content.
- Higher levels of recycled content.
- Greatest potential for re-use/recycling at end-of-life.

If the data are not readily accessible then discussions with suppliers are required.

Source: Construction Resources and Waste Roadmap 2008. http://www.crwplatform.org.uk

product selection (see Box 8). WRAP has been reviewing the impact of materials use in terms of the impact of waste arising on-site and the 'quick win' opportunities within the design that will help reduce impact. Key elements in resource-efficient materials can be the use of off-site construction methods and the ability, where demolition is required, to re-incorporate materials into the new-build phase.

In construction terms, processed construction and demolition wastes such as recycled aggregates are often perceived as 'new' products, depending on the applications for which they are being considered. WRAP has worked with the aggregate producers and regulatory bodies to develop a quality protocol for recycled aggregates that provides certainty in use for various applications (see **http://www.aggregain.org.uk/quality/quality_protocols/**). WRAP's AggRegain website (see **http://www.aggregain.org.uk**) provides a specifiers' tool to help in specification and materials choice for recycled aggregates use.

6.3 Land contamination

Land contamination must be dealt with to ensure that unacceptable risks to human health and the environment are identified and removed and that the land is brought back into beneficial use. All site development must take account of the potential for contamination and follow the advice in Planning Policy Statement 23: *Planning and Pollution Control*. Any risks must be properly assessed, and the development must incorporate any necessary remediation and subsequent management measures to deal with those risks.

The management of contaminated soils should be part of any SWMP or Materials Management Plan. The management or treatment of land contamination is an activity which may require a permit from the Environment Agency. English Partnerships' *Brownfield Guide* provides advice on techniques.[29]

Investigation and remediation of land contamination is best achieved by focusing efforts on the whole of the area affected by the contamination. Investigation and remediation work carried out on individual parcels of land is generally less satisfactory and cost effective than a whole-site solution. Land which has been remediated may become contaminated once more owing to migration of contaminants from adjacent plots which have not been remediated. This is a particular problem where groundwater pollution has occurred.

Developers should:

- Aim for best practice in site waste management, meeting the 50 per cent target for reduction in construction waste from the start of development, but aiming for zero waste to landfill.
- Use *Green Guide* A-rated components and construction materials as standard; and those aspiring to eco-town exemplar status in zero waste should use products with specific product declarations demonstrating best in class for both product and source/production process.
- Use sustainable, process-based remediation techniques for dealing with land contamination so that, wherever possible, contaminated soil is treated and re-used rather than removed to landfill.

Local planning authorities should:

- Ensure that planning conditions require validation reports to be submitted and approved to demonstrate the effectiveness of any remediation carried out.
- Ensure that in certain situations long-term monitoring is required to verify the continuing integrity of remediation schemes or any change in circumstances which might affect pollution risks.
- Consult the Local Authority Contaminated Land Network for further advice and guidance.

7 governance and funding

All eco-town applications will be accompanied by long-term governance and engagement proposals for the development. These should include specific reference to the plans for zero waste management, and how these will relate to those of other tiers of governance and waste planning – such as the local and regional waste management plans and strategies. They should also outline how the eco-town's performance on waste will be monitored and assessed.

Moving towards a zero waste community will require significant changes in behaviour. New residents and businesses will need ongoing support and advice, particularly if innovative technologies are introduced in homes and in public spaces. The eco-town management body should ensure that dedicated environmental liaison officers and appropriate resources are available to help residents and businesses, and that funding is available for the long term. Consideration should be given as to whether the management body could have a role in co-ordinating waste management services and/or managing waste-related facilities.

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annex 1
glossary

Anaerobic digestion
The decomposition of plant or animal material in the absence of oxygen. The major end products of anaerobic digestion are biogas (mainly methane), a fibrous solid 'digestate' and nutrient rich liquor.

Biowaste (biodegradable waste)
Material capable of undergoing biologically mediated decomposition.

Combined heat and power
The simultaneous generation of heat and power in a single process, putting to use heat that would normally be wasted to the atmosphere, rivers or seas.

Co-mingled
Kerbside collection schemes where all the dry recyclable materials from a household are collected mixed, typically in a single-compartment vehicle, and delivered to a materials recovery facility for sorting.

Commercial waste
Comes from premises used wholly or mainly for trade, business, sport, recreation or entertainment; excludes household and industrial waste.

Composting
Process of controlled biological decomposition of biodegradable materials under managed conditions that are predominantly aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat, in order to achieve compost that is sanitary and stable.

Digestate
Solid and/or liquid product resulting from anaerobic digestion.

Disposal
In law, disposal means any of the activities provided for in Annex IIA of the EU Waste Framework Directive.

Dry recyclables
Dry materials collected for recycling – for example paper, card, glass, cans, plastic bottles, textiles and foil.

Household waste
Waste which arises from dwellings of various types, including houses, caravans, houseboats, campsites and prisons, and wastes from schools, colleges and universities.

Industrial waste
Waste from a factory or industrial process; excludes wastes from mines and quarries and agricultural wastes.

Municipal solid waste
Predominantly household waste but includes other waste collected by local authorities (litter, parks and garden waste, and commercial waste).

Organic waste
Organic materials include garden waste, food waste and card.

Recovery
Includes all waste recycled, composted and from which energy is recovered. In law, recovery means any of the activities provided for in Annex IIB of the EU Waste Framework Directive.

Recycling
The collection and separation of materials from the waste stream and subsequent processing to produce marketable products. Recycling differs from re-use because of the need to process the recovered material to realise its value. The most desirable form of recycling, environmentally and economically, is when the recycling process creates products that are of comparable, or only slightly lowered, quality to the original.

Residual waste
Household waste not separated by the householder for recycling or composting.

Re-use
Using an object or material again, either for its original purpose or for a similar purpose, without significantly altering the physical form of the object or material.

Source separation/segregation
The separation of individual secondary materials at the point of generation for recycling.

Waste
Any substance or object which the holder discards or intends to discard is considered as waste (EU Directive 75/442).

annex 2
signposts to further sources of information

Biomass Energy Centre	http://www.biomassenergycentre.org.uk
BRE	http://www.bre.co.uk/
CIRIA	http://www.ciria.org.uk/
CLG	http://www.communities.gov.uk/
Defra	http://www.defra.gov.uk/
Environment Agency	http://www.environment-agency.gov.uk/
Envirowise	http://www.envirowise.gov.uk/
Local Authority Contaminated Land Network	http://www.contaminated-land.org/lacl.htm
National Industrial Symbiosis Programme	http://www.nisp.org.uk
UK Green Building Council	http://www.ukgbc.org/
WRAP	http://www.wrap.org.uk/

annex 3
credits available for construction waste under the code for sustainable homes and breeam

The Code for Sustainable Homes (CSH) is an environmental assessment method for new homes based upon BRE's EcoHomes and contains mandatory performance levels in nine key areas (including waste and materials).

Non-domestic buildings can be assessed using an appropriate version of BREEAM. Credits are awarded in each of eight areas according to performance. A set of environmental weightings then enables the credits to be added together to produce a single overall score. The building is then rated on a scale of: 'Pass', 'Good', 'Very good', 'Excellent' and the newly introduced level, 'Outstanding'.

The following outlines the credits available under the CSH and BREEAM.

CSH credits

Mandatory element:

- **Site waste management:** A Site Waste Management Plan must be developed and implemented. This will require monitoring and reporting of waste generated on-site in defined waste groups, and compliance with legal requirements as set out in SWMP Regulations 2008 for best practice. The plan should include the setting of targets to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and BERR. Specific targets are not required.

Additional credits:

- **Minimising construction waste:** The Site Waste Management Plan must include procedures and commitments for reducing waste generated on-site in accordance with the best practice and the defined waste groups. ***1 credit***
- **Diverting waste from landfill:** The Site Waste Management Plan must include procedures and commitments to sort and divert waste from landfill (re-use, recycle, compost or otherwise recover) according to the defined waste groups. This must be performed either on-site or through a licensed external contractor, in accordance with best practice. ***1 credit***

BREEAM credits

Credits	
3*	Up to three credits are available where evidence provided demonstrates that the amount of non-hazardous construction waste (cubic metres per 100 square metres or tonnes per 100 square metres) generated on-site by the development is the same as or better than good or best practice levels
1	Credit available where evidence provided demonstrates that a significant majority of non-hazardous construction waste generated by the development will be diverted from landfill and re-used or recycled

* Three credits are available:
a) Where non-hazardous construction waste generated by the building's construction phase (excluding demolition and excavation waste) meets or

exceeds the following resource efficiency benchmarks:

BREEAM credits	Amount of waste generated per 100 square metres (gross internal floor area),	
	cubic metres	tonnes
One credit	13.0 - 16.6	6.6 - 8.5
Two credits	9.2 - 12.9	4.7 - 6.5
Three credits	< 9.2	< 4.7

Volume (cubic metres) is actual volume of waste (not bulk volume)

b) Where there is a Site Waste Management Plan that contains:
- The target benchmark for resource efficiency, i.e. cubic metres of waste per 100 square metres or tonnes of waste per 100 square metres.
- Procedures and commitments for minimising non-hazardous waste in line with the benchmark.
- Procedures for minimising hazardous waste.
- Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste.
- Procedures for sorting, re-using and recycling construction waste into defined waste groups, either on-site or through a licensed external contractor.
- The name or job title of the individual responsible for implementing the above.

Demolition and refurbishment projects:
In addition to the above, sites with existing buildings that will be refurbished or demolished, where demolition forms a part of the principal contractor's works contract, must comply with the following:

a) Complete a pre-demolition/pre-refurbishment audit of the existing building to determine if, in the case of demolition, refurbishment is feasible, and, if not, to maximise the recovery of material from demolition or refurbishment for subsequent high-grade/high-value applications. The audit must be referenced in the SWMP and must cover:
- Identification of the key refurbishment/demolition materials.
- Potential applications and any related issues for the re-use and recycling of the key refurbishment and demolition materials.

Exemplary level requirements for BREEAM:
The following outlines the exemplary level requirements to achieve an *innovation credit* for waste:

1 Where non-hazardous construction waste generated by the building's development meets or exceeds the resource efficiency benchmark required to achieve three credits (as outlined above).
2 Where at least 90 per cent by weight (80 per cent by volume) of non-hazardous construction waste and 95 per cent of demolition waste by weight (85 per cent by volume) (if applicable) generated by the build has been diverted from landfill and either:
   a) Re-used on-site (*in situ* or for new applications).
   b) Re-used on other sites.
   c) Salvaged/reclaimed for re-use.
   d) Returned to the supplier via a 'take-back' scheme.
   e) Recovered from site by an approved waste management contractor and recycled.
3 All key waste groups are identified for diversion from landfill at pre-construction stage in the SWMP.